



# SQL Access Path Management Using SQL PerformanceExpert™ Bind ImpactExpert™

 STATE OF CALIFORNIA  
**Department of Technology Services**

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# Authors

*This presentation was prepared by:*

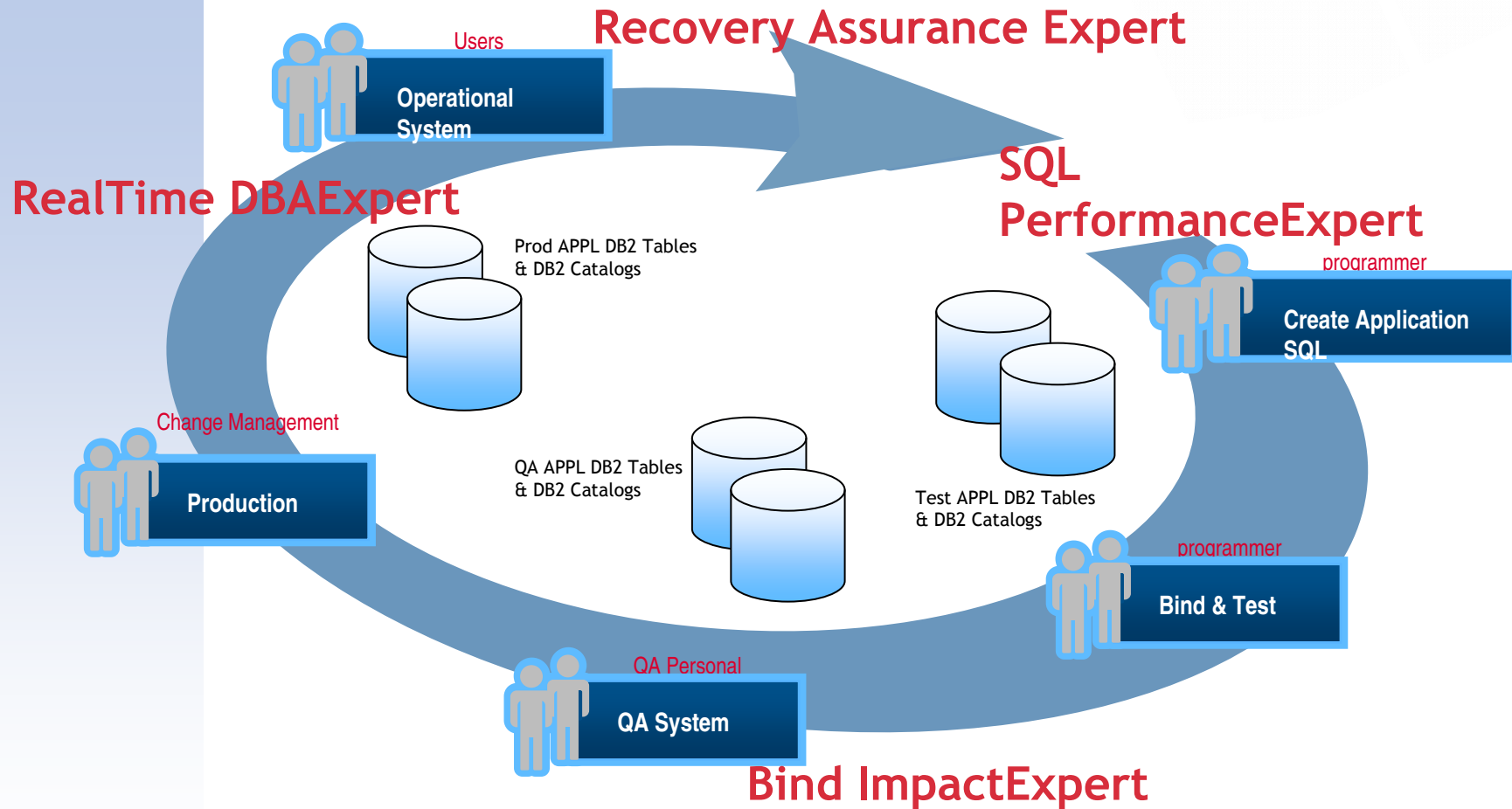
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# SQL PerformanceExpert





# SQL Performance Expert



# SQL PerformanceExpert

- A Complete DB2 SQL Tuning Tool Kit
  - Analyze component
  - Execution Time Trace component
  - Production Simulator component
  - SeQuaLizer comparison component
  - DBRM Checker component
  - Package Manager



## Analyze Component

- Enables Good SQL Programming Practices with an Expert System of Predefined Rules
- Direct Interface from ISPF and ISPF Edit
- Modify Catalog Statistics During Analysis
- Create and Maintain Shadow Copies of the Catalog
- Reports for Evaluating Plans and Packages



# Production Simulator

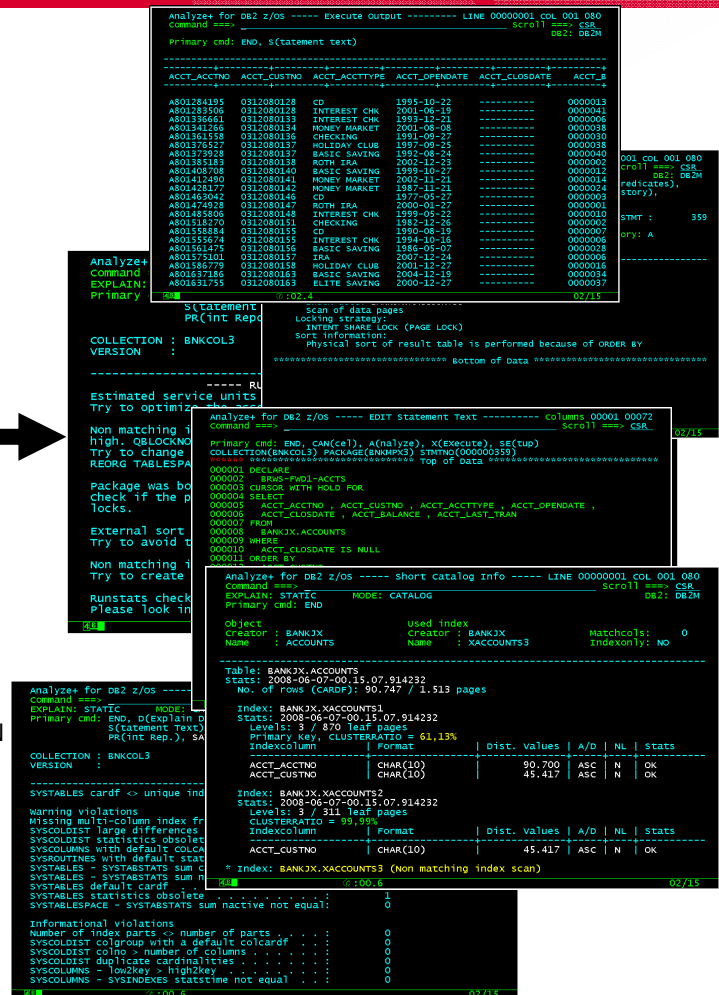
- Copy Catalog Statistics Between Environments
- Simulate Production Sized Objects in Test Environments
- Modify Statistics Through Online Interface or Batch Commands
- Create and Import Statistics for New Objects
- Seamless Integration from Analyze



**SQL Performance Expert**

***The Complete SQL Tuning Tool Kit***







# Main Menu

```
SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help
Analyze+ for DB2 z/OS ----- Main Menu ----- Version 6.10
Command ==> 1 DB2: DB2M
Primary cmd: END, ABOUT
1. Package analysis
2. Plan DBRM analysis
3. Extended catalog browser
4. SQL statements or DBRM member analysis
5. Dynamic SQL statements (DSC) analysis
B. Generate batch jobs
C. Collect static and dynamic SQL
S. Settings
X. Terminate Analyze+ for DB2 z/OS
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4B :00.1 02/16
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC019) | Keys: 111872 Saved: 0000 | NUM | 8:22 AM
```



## Analyzing Source or DBRM (Development Workbench)

```
SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help
[Icons]
Analyze+ for DB2 z/OS ----- Main Menu ----- Version 6.10
Command ==> 4 DB2: DB2M

Primary cmd: END, ABOUT

1. Package analysis
2. Plan DBRM analysis
3. Extended catalog browser
4. SQL statements or DBRM member analysis
5. Dynamic SQL statements (DSC) analysis

B. Generate batch jobs
C. Collect static and dynamic SQL
S. Settings

X. Terminate Analyze+ for DB2 z/OS

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[4B] [Clock] :00.1 02/16
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC019) | Keys: 111928 Saved: 0000 | NUM | 8:25 AM
```



# Analyzing a program

```
SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help
[Icons]
Analyze+ for DB2 z/OS ----- Analysis for SQL Statements or DBRMs -----
Command ==> _____ DB2: DB2M

Primary cmd: END, SE(tup), B(atch Prepare)

DSNAME      : 'MKT.SEG.DEMO5.JCL.CNTL(DEMO5PU5)'
QUALIFIER   : _____

DEGREE      : ANY      1/ANY

Processing parms:
LANGUAGE    : COB      ASM/FOR/C/COB/PLI/PL1/SPU Source Language
BOUNDS      : 7        72 01-80 Left and right boundary for source input

[4B] [00.1] 06/16
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC022) | Keys: 112084 Saved: 0000 | NUM | 9:09 AM
```



# Edit the program here

```
SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help
Analyze+ for DB2 z/OS ----- EDIT Statement Text ----- columns 00001 00072
Command ==> a scroll ==> CSR

Primary cmd: END, CAN(cel), A(nalyze), X(EXecute), SE(tup)
FILE : MKT.SEG.DEMO5.JCL.CNTL(DEMO5PU5)
***** ***** Top of Data *****
000001 000100 ID DIVISION.
000002 000200 PROGRAM-ID. DEMO5PU5
000003 000300 DATE-COMPILED.
000004 000400 *REMARKS.
000005 000500 *****
000006 000600 * SIMULATE A REAL ENVIROMENT
000007 000700 *****
000008 000800 * THIS PROGRAM WILL FIND ALL OPEN LOANS AND CLOSED
000009 000900 * THE FIRST X BASED ON PARMS SENT IN
000010 001400 *
000011 003300 *****
000012 003400 * CHANGE LOG:
000013 003500 *
000014 003600 * 02.21.08 - DAY ONE
000015 004100 *****
000016 004200 ENVIRONMENT DIVISION.
000017 004210 INPUT-OUTPUT SECTION.
000018 004300 DATA DIVISION.

4B :00.2 02/16
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC022) | Keys: 112096 Saved: 0000 | NUM | 9:13 AM
```





# List of package statements

```

SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help

Analyze+ for DB2 z/OS ----- Package Statements (1/2) ----- Statement 1 from 4
Command ==> _____ Scroll ==> CSR
                                      DB2: DB2M

Primary cmd: END, SE(tup), BA(Batch Prepare All), L(ocate) stmtno
Line      cmd: Z(oom), A(nalyze), D(ynamic Analyze), B(atch Prepare),
              E(dit Statement), X(EXecute Statement)

collection : DEMO5
Package    : DEMO5PU5
Version    : - NONE -
Bindtime   : 2009-01-27-08.28.35.565528 PreComp : 2009-01-27-08.28.34.668855

  StmtNo  SectNo  Millisec  Servunits  Cat  Statement_Text
-----
a A       359      1         50       1022 A  DECLARE BRWS-FWD1-LOANS CURSO
  —       370      2         49       1012 A  DECLARE BRWS-FWD2-LOANS CURSO
  —       377      3          1          1 A  DECLARE BRWS-FWD1-PAYM CURSOR
  —       471      4          1          2 A  UPDATE LOANS SET LOAN_BALANCE
-----

4B  :00.1  16/02
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC019)
start  VISA  Network Connect...  Inbox - Microsoft...  NEON Corp Over...  spxshots.ppt  SYSC - EXTRA! X...  7:35 AM

```



# Analyze a statement

```
SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help
Analyze+ for DB2 z/OS ----- Explain Data (1/5) ----- Entry 1 from 1
Command ==> v Scroll ==> CSR
EXPLAIN: STATIC MODE: CATALOG DB2: DB2M
Primary cmd: END, T(Explain Text), V(iolations), R(unstats), P(redicates),
S(statement Text), C(atalog Data), M(ode Catalog/History), Z(oom),
PR(int Reports), SAVExxx, SHOWxxx
Line cmd: Z(oom), I(ndexes of table), S(hort catalog), T(able), X(Index)

Collection : DEMO5 Package : DEMO5PU5 Stmt : 359
Version :
Milliseconds: 50 Service Units: 1022 Cost Category: A

QBNO QBTYPE CREATOR TABLE NAME MTCH IX METH PRNT TABL PRE MXO
PLNO TABNO XCREATOR INDEX NAME ACTYP COLS ON OD QBLK TYPE FTCH PSQ
-----
1 SELECT DEMO5 LOANS I 0 N 0 0 T D 0
1 1 DEMO5 XLOANS2
-----

4B :00.1 02/16
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC019) | Keys: 111711 Saved: 0000 | NUM | 7:37 AM
```



# Rules violations

```
SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help

Analyze+ for DB2 z/OS ----- Violations ----- LINE 00000001 COL 001 080
Command ==>                                     Scroll ==> PAGE
EXPLAIN: STATIC          MODE: CATALOG          DB2: DB2M
Primary cmd: END, D(Explain Data), T(Explain Text), R(unstats), P(predicates),
              S(statement Text), C(atalog Data), M(mode Catalog/History),
              PR(int Reports), SAVExxx, SHOWxxx

COLLECTION : DEMO5          PACKAGE : DEMO5PU5      STMT :      359
VERSION    :

-----
----- RULE-NO.: 9001      (WARNING) -----
Estimated runtime > 25 milliseconds.
Try to optimize the access.
----- RULE-NO.: 9002      (WARNING) -----
Estimated service units > 25.
Try to optimize the access.
----- RULE-NO.: 9022      (WARNING) -----
Package was bound with ISOLATIONLEVEL(CS) and CURRENTDATA(YES).
Check if the package can be bound with CURRENTDATA(NO) to avoid unnecessary
locks.
----- RULE-NO.: 9055      (WARNING) -----
Non matching index scan, NLEAF > 32 and INDEXONLY = N. QBLOCKNO: 1, PLANNO: 1
Try to create the index access with as many matching columns as possible.

4B  :00.3 02/15
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC019) | | | Keys: 111755 Saved: 0000 | NUM | 7:43 AM
```





# List of available index fields

```

SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help

Analyze+ for DB2 z/OS ----- Catalog Report ----- LINE 00000001 COL 001 080
Command ==>                                scroll ==> PAGE
EXPLAIN: STATIC          MODE: CATALOG          DB2: DB2M
Primary cmd: END, D(Explain Data), T(Explain Text), V(iolations), R(unstats),
             S(tatement Text), P(redicates), M(ode Catalog/History),
             PR(int Reports), SAVExxx, SHOWxxx

-----
Table: DEMO5.LOANS
Stats: 2009-01-27-08.28.34.119875
      No. of rows (CARDP): 9.000 / 300 pages

Index: DEMO5.XLOANS1
Stats: 2009-01-27-08.28.34.119875
      Levels: 2 / 60 leaf pages
      Primary Key, CLUSTERRATIO = 99,00%
Indexcolumn | Format | Dist. Values | A/D | NL | Stats
-----+-----+-----+-----+-----+-----
LOAN_LOANNO | CHAR(10) | 210 | ASC | N | OK
LOAN_CUSTNO | CHAR(10) | 100 | ASC | N | OK

* Index: DEMO5.XLOANS2 (Non matching index scan)
Stats: 2009-01-27-08.28.34.119875
      Levels: 2 / 60 leaf pages

4B  :00.1 02/15

```

Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC019) | Keys: 111795 Saved: 0000 | NUM | 7:49 AM



# Show predicate use

```
SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help
Analyze+ for DB2 z/OS ----- Predicates (1/3) ----- Predicate 1 from 1
Command ==> _____ Scroll ==> CSR
EXPLAIN: STATIC          MODE: CATALOG          DB2: DB2M
Primary cmd: END, D(Explain Data), T(Explain Text), V(iolations), R(unstats),
             S(tatement Text), C(atalog Data), M(ode Catalog/History), Z(oom),
             PR(int Reports), SAVExxx, SHOWxxx
Line      cmd: Z(oom)

collection : DEMO5          Package : DEMO5PU5          Stmt :      359
Version    :

  Qb1kno PredNo  Left_Hand_Side  Right_Hand_Side  Stage  PredType
  -----
  _      1      1  LOAN_CLOSEDATE  NULL      SCREENING  EQUAL
  -----
```

4B :00.1 02/15

Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC019) | Keys: 111771 Saved: 0000 | NUM | 7:46 AM



# Statement Text

```
SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help
Analyze+ for DB2 z/OS ----- Statement Text ----- LINE 00000001 COL 001 080
Command ==>                               scroll ==> PAGE
EXPLAIN: STATIC          MODE: CATALOG          DB2: DB2M
Primary cmd: END, D(Explain Data), T(Explain Text), V(iolations), R(unstats),
              P(edicates), C(atalog Data), M(ode Catalog/History),
              PR(int Reports), SAVExxx, SHOWxxx

COLLECTION : DEMO5          PACKAGE : DEMO5PU5          STMT :          359
VERSION    :

-----
DECLARE
  BRWS-FWD1-LOANS
CURSOR WITH HOLD FOR
SELECT
  LOAN_LOANNO , LOAN_CUSTNO , LOAN_LOANTYPE , LOAN_LOANYEARS ,
  LOAN_LOANAMT , LOAN_OPENDATE , LOAN_CLOSDATE , LOAN_BALANCE ,
  LOAN_LAST_PAYMENT , LOAN_INTEREST_RATE
FROM
  LOANS
WHERE
  LOAN_CLOSDATE IS NULL
ORDER BY
  LOAN_CUSTNO DESC

4B  :00.1 02/15
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC019) | Keys: 111761 Saved: 0000 | NUM | 7:46 AM
```



# Editing the SQL

```

SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help

Analyze+ for DB2 z/OS ----- DBRM Statements (1/2) ----- statement 1 from 4
Command ==> _____ Scroll ==> CSR
                                      DB2: DB2M

Primary cmd: END, SE(tup), ALL, L(ocate) stmtno
Line      cmd: Z(oom), D(ynamic Analyze), E(dit Statement), X(EXecute statement)

Library   : MKT.SEG.DEMO5.DB2M.DBRMLIB
Member    : DEMO5PU5
Version   :
Contoken  : 18750FE814FF4DFD      PrecompTS : 2009-01-27-14.28.34.668855

      StmtNo   SectNo   Millisec   Servunits   Cat   Statement_Text
-----
e      359      1         0           0      DECLARE BRWS-FWD1-LOANS CURSOR
-      370      2         0           0      DECLARE BRWS-FWD2-LOANS CURSOR
-      377      3         0           0      DECLARE BRWS-FWD1-PAYM CURSOR
-      471      4         0           0      UPDATE LOANS SET LOAN_BALANCE
-----

4B  :00.1  15/02
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC019)  Keys: 111945 Saved: 0000  NUM  8:27 AM
  
```



## Editing more

```
SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help

Analyze+ for DB2 z/OS ----- EDIT Statement Text ----- columns 00001 00072
Command ==> _____ scroll ==> CSR

Primary cmd: END, CAN(cel), A(nalyze), X(EXecute), SE(tup)
DBRM : MKT.SEG.DEMO5.DB2M.DBRMLIB(DEMO5PU5) STMTNO(000000359)
***** ***** Top of Data *****
000001 DECLARE
000002   BRWS-FWD1-LOANS
000003 CURSOR WITH HOLD FOR
000004 SELECT
000005   LOAN_LOANNO , LOAN_CUSTNO , LOAN_LOANTYPE , LOAN_LOANYEARS ,
000006   LOAN_LOANAMT , LOAN_OPENDATE , LOAN_CLOSDATE , LOAN_BALANCE ,
000007   LOAN_LAST_PAYMENT , LOAN_INTEREST_RATE
000008 FROM
000009   LOANS
000010 WHERE
000011   LOAN_CLOSDATE IS NULL
000012 ORDER BY
000013   LOAN_CUSTNO DESC
***** ***** Bottom of Data *****

4B :00.1 02/15
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC019) | Keys: 111946 Saved: 0000 | NUM | 8:29 AM
```





# Execute Statement

```
Analyze+ for DB2 z/OS ----- Execute Output ----- LINE 00000001 COL 001 080
Command ==> _____ scroll ==> CSR
DB2: DB2M
```

```
Primary cmd: END, s(tatement text)
```

ACCT_ACCTNO	ACCT_CUSTNO	ACCT_ACCTTYPE	ACCT_OPENDATE	ACCT_CLOSDATE	ACCT_B
A801284195	0312080128	CD	1995-10-22	-----	0000013
A801283506	0312080128	INTEREST CHK	2001-06-19	-----	0000041
A801336661	0312080133	INTEREST CHK	1993-12-21	-----	0000006
A801341266	0312080134	MONEY MARKET	2001-08-08	-----	0000038
A801361558	0312080136	CHECKING	1991-09-27	-----	0000030
A801376527	0312080137	HOLIDAY CLUB	1997-09-25	-----	0000038
A801373928	0312080137	BASIC SAVING	1992-08-24	-----	0000040
A801385183	0312080138	ROTH IRA	2002-12-23	-----	0000002
A801408708	0312080140	BASIC SAVING	1999-10-27	-----	0000012
A801412490	0312080141	MONEY MARKET	2002-11-21	-----	0000014
A801428177	0312080142	MONEY MARKET	1987-11-21	-----	0000024
A801463042	0312080146	CD	1977-05-27	-----	0000003
A801474928	0312080147	ROTH IRA	2000-01-27	-----	0000001
A801485806	0312080148	INTEREST CHK	1999-05-22	-----	0000010
A801518270	0312080151	CHECKING	1982-12-26	-----	0000002
A801558884	0312080155	CD	1990-08-19	-----	0000007
A801555674	0312080155	INTEREST CHK	1994-10-16	-----	0000006
A801561475	0312080156	BASIC SAVING	1986-05-07	-----	0000028
A801575101	0312080157	IRA	2007-12-24	-----	0000006
A801586779	0312080158	HOLIDAY CLUB	2001-12-27	-----	0000016
A801637186	0312080163	BASIC SAVING	2004-12-19	-----	0000034
A801631755	0312080163	ELITE SAVING	2000-12-27	-----	0000037

4/8

:02.4

02/15



# Runstats

```
Analyze+ for DB2 z/OS ----- Runstats ----- LINE 00000064 COL 001 080
Command ==> _____ scroll ==> CSR
EXPLAIN: STATIC      MODE: CATALOG      DB2: DB2M
Primary cmd: END, D(Explain Data), T(Explain Text), V(iolations), P(predicates),
             S(statement Text), C(atalog Data), M(ode Catalog/History),
             PR(int Rep.), SAVExxx, SHOWxxx

COLLECTION : BNKCOL3          PACKAGE : BNKMPX3          STMT :          359
VERSION      :

-----
SYSTABLES cardf <> unique index fullkeycardf . . :          0

Warning violations
Missing multi-column index frequencies . . . . . :          6
SYSCOLDIST large differences found in STATTIME :          0
SYSCOLDIST statistics obsolete . . . . . :          0
SYSCOLUMNS with default COLCARDF . . . . . :          0
SYSROUTINES with default statistics . . . . . :          0
SYSTABLES - SYSTABSTATS sum cardf not equal . . :          0
SYSTABLES - SYSTABSTATS sum npages not equal . . :          0
SYSTABLES default cardf . . . . . :          0
SYSTABLES statistics obsolete . . . . . :          1
SYSTABLESPACE - SYSTABSTATS sum nactive not equal:          0

Informational violations
Number of index parts <> number of parts . . . . . :          0
SYSCOLDIST colgroup with a default colcardf . . :          0
SYSCOLDIST colno > number of columns . . . . . :          0
SYSCOLDIST duplicate cardinalities . . . . . :          0
SYSCOLUMNS - low2key > high2key . . . . . :          0
SYSCOLUMNS - SYSINDEXES statstime not equal . . :          0
```

4B

:00.6

02/15



# How to change stats

```
SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help
[Icons]
Analyze+ for DB2 z/OS ----- Change RUNSTATS ----- Table 1 from 1
Command ==> _____ scroll ==> CSR
DB2: DB2M

Primary cmd: END, Z(oom), L(ocate) - TBCreator -
Line cmd: C(opy RUNSTATS values directly),
E(dit RUNSTATS values before update), Z(oom)

FROM DATASET (KSDS) ==> JAB6.PRODUCT.IQA0610.DB2M.VSAM.KSDS
X FROM DB2

Target Objects          Source Objects
TBCreator TBName       DB2 TBCreator TBName
-----
BANKTEST LOANS
-----

[4B] [Icon] :00.1 02/15
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC022) | | | Keys: 112131 Saved: 0000 | NUM | 9:17 AM
```





# Dynamic SQL

```
Analyze+ for DB2 z/OS ----- Main Menu ----- Version 6.10  
Command ==> 5 DB2: DB2M
```

```
Primary cmd: END, ABOUT
```

1. Package analysis
  2. Plan DBRM analysis
  3. Extended catalog browser
  4. SQL statements or DBRM member analysis
  5. Dynamic SQL statements (DSC) analysis
- B. Generate batch jobs  
C. Collect static and dynamic SQL  
S. Settings
- X. Terminate Analyze+ for DB2 z/OS

```
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```

```
4B
```

```
:03.1
```

```
02/16
```



# Dynamic SQL Limiting

```

Analyze+ for DB2 z/OS ----- Limit DSC Snapshot -----
Command ==> _____ DB2: DB2M

Primary cmd: END, SIZE nnnnnnnn Return area: 2097152

MEMBER      : * _____ Blank(Connected DB2) / *(All members) / member name

NO LIMITATION : X
HIGHEST VALUES : _ NUMBER : 0 (approx.)
EXCEED THRESHOLD: _ THRESHOLD: _____

For limitation to highest values or exceeding a specified threshold
EXECUTIONS    : _ ROWS PROCESSED : _ SORTS : _
BUFFER READS  : _ ROWS EXAMINED  : _ PARALLEL GROUPS : _
BUFFER WRITES : _ INDEX SCANS    : _ RID EXCEED DB2 LIMITS : _
GETPAGES      : _ TABLE SPACE SCANS : _ RID EXCEED STORAGE : _

For limitation to highest values only
ELAPSE TIME   : _ CPU TIME : _

WAIT TIME FOR ...
SYNCHRONOUS I/O : _ SYNCR. EXECUTION : _ READS OTHER THREADS : _
LOCK AND LATCH : _ GLOBAL LOCKS : _ WRITES OTHER THREADS : _
  
```

4B

:02.1

02/15



# Dynamic SQL Filtering

```
Analyze+ for DB2 z/OS ----- Filter Dynamic Statement Cache -----
Command ==> _____ DB2: DB2M

Primary cmd: END

FIRST TABLE : *
CREATOR      _____

FIRST TABLE : *
NAME         _____

PROGNAME     : *
            _____

PRIMARY      : *
AUTHID       _____

SELECT  ☒ CURRENT USERS  between _____ and _____ (Integer)
INSERT  ☒ STMT COUNT    between _____ and _____ (Integer)
UPDATE  ☒ AVG CPU TIME   between _____ and _____ (MM:SS.TTT)
DELETE  ☒ AVG ELAPSE TIME between _____ and _____ (MM:SS.TTT)
                                AVG GETPAGES  between _____ and _____ (Integer)

Total stmts      125
OUTPUT LIMIT:    10000 0 - 25000 Max number of statements to be displayed
```

4B

:01.5

02/15



# Dynamic SQL

Analyze+ for DB2 z/OS --- Dynamic Statement Cache (1/8) - Statement 1 from 125  
 Command ==> \_\_\_\_\_ Scroll ==> CSR  
 DB2: DB2M

Primary cmd: END, Z(oom), L(ocate) stmtid  
 Line cmd: Z(oom), A(nalyze), E(dit Statement), S(tatement Text), T(able),  
 X(EXecute)

StmtID	Count	Program	PrAuthID	Qualifier	Executes	Getpages	S
1	1	SEDBCAF	JAB1	JAB1	0	0	V
2	1	IQADBACP	JAB1	JAB1	0	0	V
3	1	IQADBACP	JAB1	JAB1	0	0	V
4	1	IQADBACP	JAB1	JAB1	0	0	V
5	1	IQADBACP	JAB1	JAB1	0	0	V
6	1	IQADBACP	JAB1	JAB1	0	0	V
7	1	IQADBACP	JAB1	JAB1	0	0	V
8	1	IQADBACP	JAB1	JAB1	0	0	V
9	1	IQADBACP	JAB1	JAB1	0	0	V
10	1	IQADBACP	JAB1	JAB1	0	0	V
11	1	IQADBACP	JAB1	JAB1	0	0	V
12	1	IQADBACP	JAB1	JAB1	0	0	V
15	1	IQADBACP	JAB1	JAB1	0	0	V
16	1	IQADBACP	JAB1	JAB1	0	0	V
17	1	IQADBACP	JAB1	JAB1	0	0	V
18	1	IQADBACP	JAB1	JAB1	0	0	V
19	1	IQADBACP	JAB1	JAB1	0	0	V
20	1	IQADBACP	JAB1	JAB1	0	0	V
21	1	IQADBACP	JAB1	JAB1	0	0	V
22	1	IQADBACP	JAB1	JAB1	0	0	V
23	1	IQADBACP	JAB1	JAB1	0	0	V
24	1	IQADBACP	JAB1	JAB1	0	0	V
25	1	IQADBACP	JAB1	JAB1	0	0	V

4B

:00.2

02/15



# Dynamic SQL

Analyze+ for DB2 z/OS --- Dynamic Statement Cache (2/8) - Statement 1 from 125  
 Command ==> \_\_\_\_\_ Scroll ==> CSR  
 DB2: DB2M

Primary cmd: END, Z(oom), L(ocate) stmtid

Line cmd: Z(oom), A(nalyze), E(dit Statement), S(tatement Text), T(able),  
 X(EXecute)

	StmtID	StmtLen	Statementtext
— A	1	100	SELECT CAST(GETVARIABLE('SYSIBM.VERSION'))
—	2	221	SELECT USER_AUTH_LIST , GROUP_PROFILE FROM IQA0610.IQA
—	3	132	SELECT PROFILE_NAME, CREATOR, PROFILE_TYPE, PROFILE_
—	4	241	SELECT A.SET_ID , A.SET_VALUE , COALESCE(B.SET_VALUE ,
—	5	999	SELECT K.LOCATION , K.COLLID , K.NAME , K.CONTOKEN , H
—	6	723	SELECT 0 , 0 , 0 , STMT , ISOLATION , STATUS , ACCESSP
—	7	220	SELECT QUERYNO , STMT_TYPE , FLOAT(PROCMS) , FLOAT(PRO
—	8	809	SELECT 0 , 0 , 0 , STMT , ISOLATION , STATUS , ACCESSP
—	9	955	SELECT "QUERYNO" , QBLOCKNO , APPLNAME , RTRIM(PROGNAME)
—	10	894	INSERT INTO IQA0610.IQA_PLAN_TABLE ("QUERYNO" , QBLOCKN
—	11	291	SELECT "QUERYNO" , APPLNAME , RTRIM(PROGNAME) , RTRIM(COL
—	12	203	INSERT INTO IQA0610.IQA_STATEMNT_TABLE ("QUERYNO" , APP
—	15	177	SELECT SQLID, USED, TIMESTAMP, RESERVE, CURRENT TIMEST
—	16	114	UPDATE IQA0610.IQA_EXPLAIN_SETS SET USED = ? , RESERVE
—	17	265	SELECT 1 FROM IQA0610.IQA_PLAN_TABLE UNION ALL SELECT
—	18	33	DELETE FROM IQAEXP01.PLAN_TABLE
—	19	40	DELETE FROM IQAEXP01.DSN_STATEMNT_TABLE
—	20	40	DELETE FROM IQAEXP01.DSN_PREDICAT_TABLE
—	21	38	DELETE FROM IQAEXP01.DSN_FILTER_TABLE
—	22	39	DELETE FROM IQAEXP01.DSN_DETCOST_TABLE
—	23	455	SELECT "QUERYNO" , QBLOCKNO , APPLNAME , PROGNAME , PREDNO
—	24	509	INSERT INTO IQA0610.IQA_PREDICAT_TABLE ("QUERYNO" , QBL
—	25	168	SELECT "QUERYNO" , QBLOCKNO , PLANNO , APPLNAME , PROGNAME

4B

:00.2

02/15



# Dynamic SQL

Analyze+ for DB2 z/OS --- Dynamic Statement Cache (6/8) - Statement 1 from 125  
Command ==> \_\_\_\_\_ Scroll ==> CSR  
DB2: DB2M

Primary cmd: END, Z(oom), L(ocate) stmtid  
Line cmd: Z(oom), A(nalyze), E(dit Statement), S(tatement Text), T(able),  
X(EXecute)

	StmtID	Total CPU	Average CPU	Total Elapse	Average Elapse
	-----	HHHH:MM:SS.ttt	HHHH:MM:SS.ttt	HHHH:MM:SS.ttt	HHHH:MM:SS.ttt
- A	1	-	-	-	-
-	2	-	-	-	-
-	3	-	-	-	-
-	4	-	-	-	-
-	5	-	-	-	-
-	6	-	-	-	-
-	7	-	-	-	-
-	8	-	-	-	-
-	9	-	-	-	-
-	10	-	-	-	-
-	11	-	-	-	-
-	12	-	-	-	-
-	15	-	-	-	-
-	16	-	-	-	-
-	17	-	-	-	-
-	18	-	-	-	-
-	19	-	-	-	-
-	20	-	-	-	-
-	21	-	-	-	-
-	22	-	-	-	-
-	23	-	-	-	-
-	24	-	-	-	-
-	25	-	-	-	-

4B

:00.2

02/15



# Dynamic SQL

```
Analyze+ for DB2 z/OS ----- Explain Data (1/5) ----- Entry 1 from 1
Command ==> _____ Scroll ==> CSR
EXPLAIN: DYNAMIC          MODE: CATALOG                      DB2: DB2M
Primary cmd: END, T(Explain Text), V(iolations), R(unstats), P(redicates),
              S(tatement Text), C(atalog Data), M(ode Catalog/History), Z(oom),
              PR(int Reports), SAVExxx, SHOWxxx
Line   cmd: Z(oom), I(ndexes of table), S(hort catalog), T(able), X(Index)

Dynamic Statement Cache DB2/Group member:
RunID : -                Created : 2009-02-05-09.42.08.879270   StmtID :          1
Milliseconds:           91 Service Units:           1878 Cost Category: B
```

QBNO	QBTYPE	CREATOR	TABLE NAME	MTCH	IX	METH	PRNT	TABL	PRE	MXO	
PLNO	TABNO	XCREATOR	INDEX NAME	ACTYP	COLS	ON	OD	QBLK	TYPE	FTCH	PSQ
1	SELECT	SYSIBM	SYSDDUMMY1	R	0	N	0	0	T	S	0
1	1										

4B

@:01.7

02/15



# Using the edit macro

```
SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help
File Edit Edit_Settings Menu Utilities Compilers Test Help

EDIT      MKT.SEG.DEMO5.JCL.CNTL(DEMO5PU5) - 01.04      columns 00001 00072
Command ==> analyze      Scroll ==> CSR
***** ***** Top of Data *****
000001 000100 ID DIVISION.
000002 000200 PROGRAM-ID.      DEMO5PU5
000003 000300 DATE-COMPILED.
000004 000400 *REMARKS.
000005 000500 *****
000006 000600 *      SIMULATE A REAL ENVIROMENT
000007 000700 *****
000008 000800 *      THIS PROGRAM WILL FIND ALL OPEN LOANS      AND CLOSED
000009 000900 *      THE FIRST X BASED ON PARMS SENT IN
000010 001400 *
000011 003300 *****
000012 003400 * CHANGE LOG:
000013 003500 *
000014 003600 * 02.21.08 - DAY ONE
000015 004100 *****
000016 004200 ENVIRONMENT DIVISION.
000017 004210 INPUT-OUTPUT SECTION.
000018 004300 DATA DIVISION.
000019 004301 FILE SECTION.

4B :00.1 04/22
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC022) | Keys: 112433 Saved: 0000 | NUM | 9:34 AM
```





## Or block select a SQL

```
SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help
File Edit Edit_Settings Menu Utilities Compilers Test Help

EDIT      MKT.SEG.DEMO5.JCL.CNTL(DEMO5PU5) - 01.04      columns 00001 00072
Command ==> analyze                                     scroll ==> CSR
##0176      EXEC SQL
000177      DECLARE BRWS-FWD1-PAYM CURSOR FOR
000178      SELECT PAYM_LOANNO, PAYM_CUSTNO,
000179      PAYM_PAYMNO, PAYM_PAYMENT
000180      FROM PAYMENTS
000181      WHERE PAYM_CUSTNO = :PAYM-CUSTNO      AND
000182      PAYM_LOANNO = :PAYM-LOANNO
000183      ORDER BY PAYM_PAYMNO DESC
##0184      END-EXEC.
000185 078837
000186 079350 01 WS-SKELETON-MESSAGE.
000187 079360 05 WS-SKEL-MSG-NBR      PIC 999.
000188 079393 05 WS-SKEL-MSG-TEXT      PIC X(65).
000189 079400 *****
000190 079500 *** SPECIAL REGISTER SIMULATION -- CURRENT-DATE, TIME-OF-DAY ***
000191 079600 *****
000192 079700 01 OSVS-RESERVED.
000193 079800 03 ACCEPT-DATE      PIC XXXX/XX/BB.
000194 079900 03 FILLER      REDEFINES ACCEPT-DATE.
000195 080000 05 FILLER      PIC X(02).

4B :00.1 13/04
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC022) | Keys: 112617 Saved: 0000 | NUM | 9:37 AM
```



# Settings

```
SYSC - EXTRA! X-treme
File Edit View Tools Session Options Help
[Icons]
Analyze+ for DB2 z/OS ----- Main Menu ----- Version 6.10
Command ==> 4 DB2: DB2M

Primary cmd: END, ABOUT

1. Package analysis
2. Plan DBRM analysis
3. Extended catalog browser
4. SQL statements or DBRM member analysis
5. Dynamic SQL statements (DSC) analysis

B. Generate batch jobs
C. Collect static and dynamic SQL
S. Settings

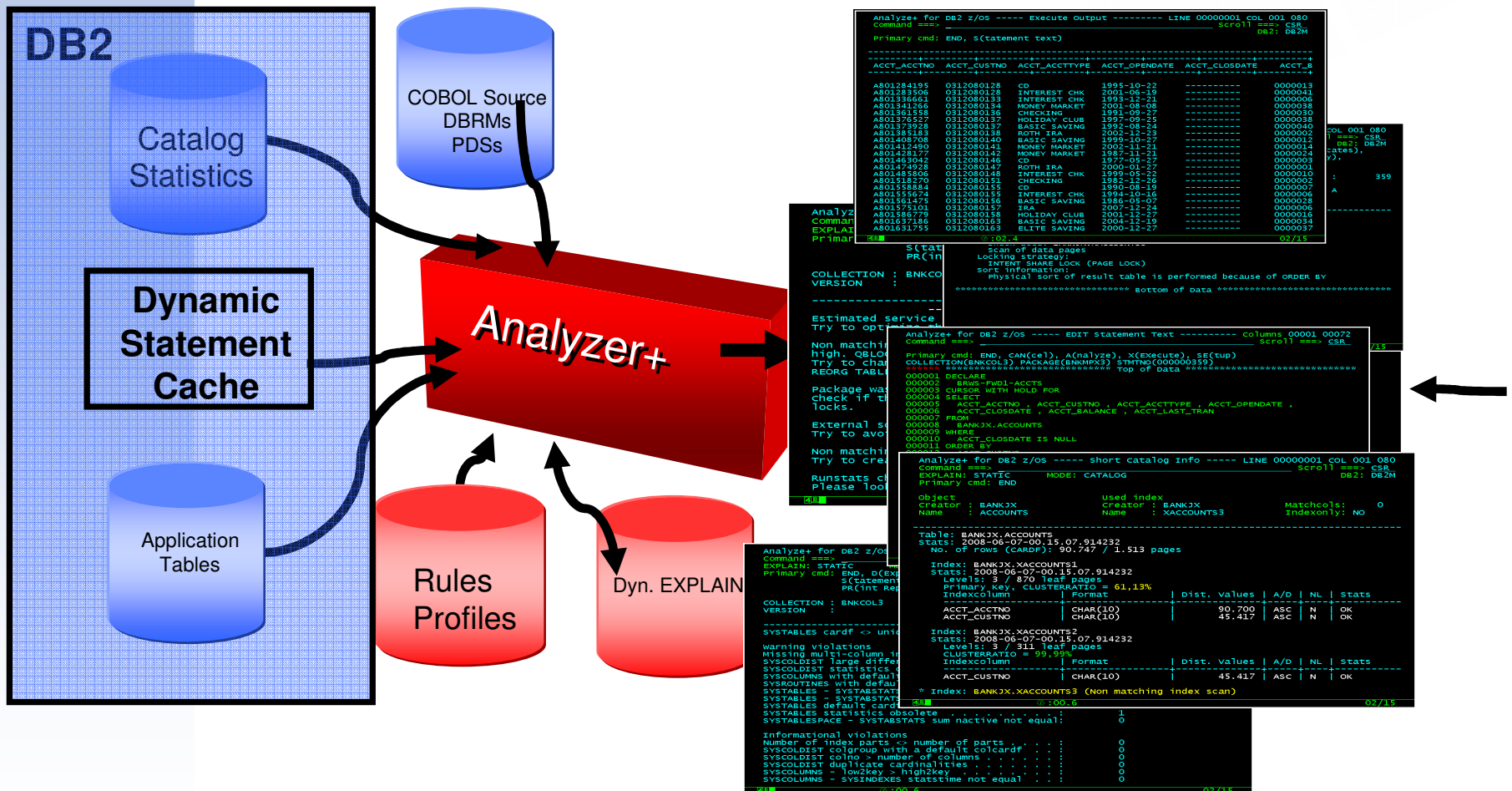
X. Terminate Analyze+ for DB2 z/OS

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[4B] :00.1 02/16
Connected to host sysc.neonesoft.com [10.37.100.33] (NESSC019) | Keys: 111928 Saved: 0000 | NUM | 8:25 AM
```



## In Summary





# Bind Impact Expert

**A DB2-z Access Path Analysis Tool**



# Analysis Methodology

- Two level approach
- Background execution
  - High speed
  - Unattended execution
  - Reports
- Foreground analysis
  - Increased productivity
  - Categorization
  - Drill down



## Analysis Methodology

- Requires EXPLAIN(YES)
- Dynamic Explain on Each Statement
- Compare Dynamic Explain Results to PlanTable
- Apply Internal Weighting Factor to Each Statement
- Compare and Report Results

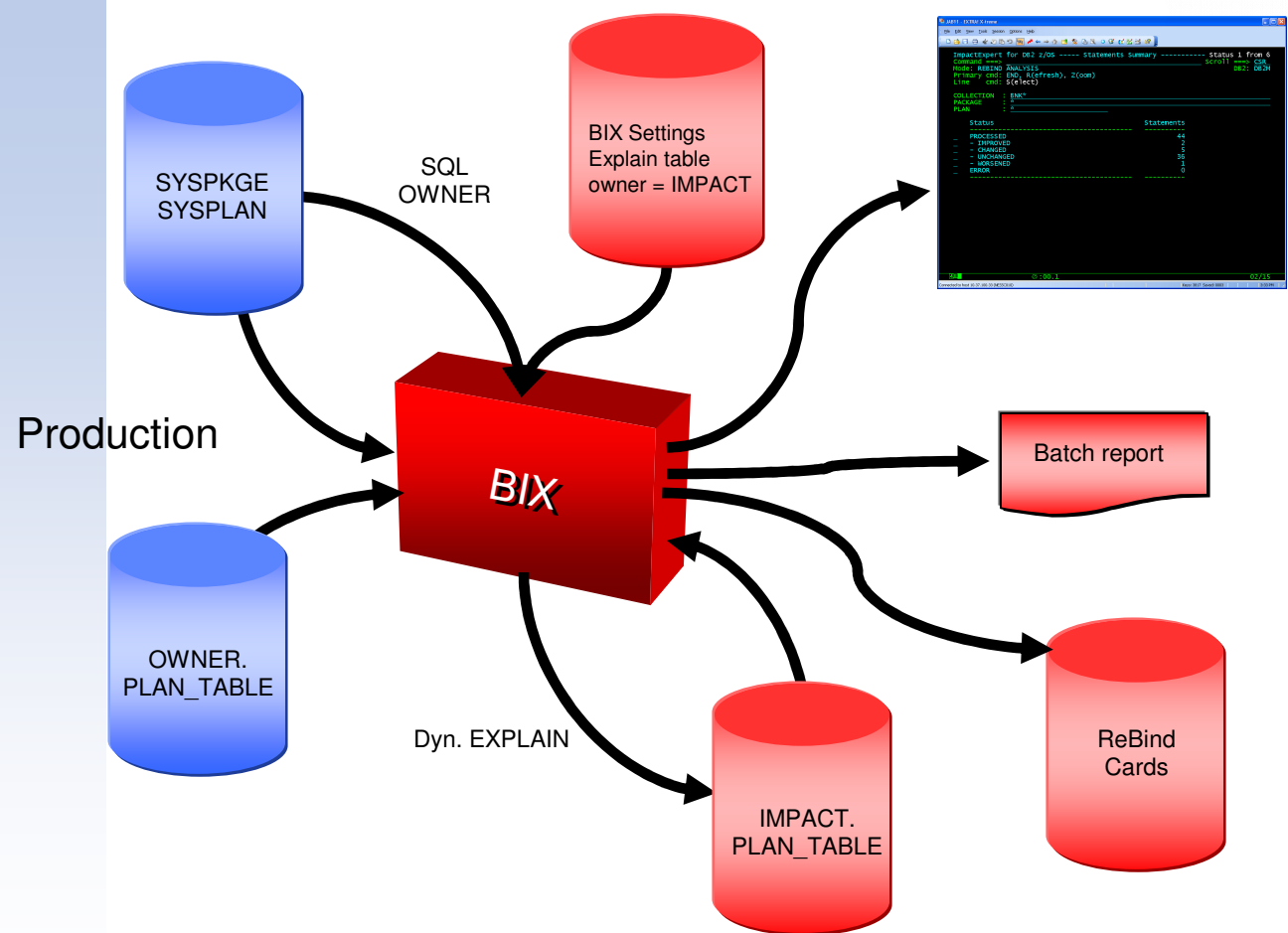


## A few Scenarios

Function	Old SQL	New SQL	Description
REBIND Analysis	Catalog	-	<b>Batch Maintenance Cycle after Reorgs/Runstats</b>
Early Precheck	Shadow	-	<b>New DB2 version or after applying DB2 Maintenance</b>
Pre-BIND Analysis	Catalog	DBRM	<b>Prescreen changed applications</b>
Post-BIND Analysis	History	Catalog	<b>Analyze applications changes over time</b>
Pre-BIND Analysis Production Baseline	Shadow	DBRM	<b>Analyze applications changes against production</b>
Post-BIND Analysis Production Baseline	Shadow	Catalog	<b>Analyze applications changes against production</b>



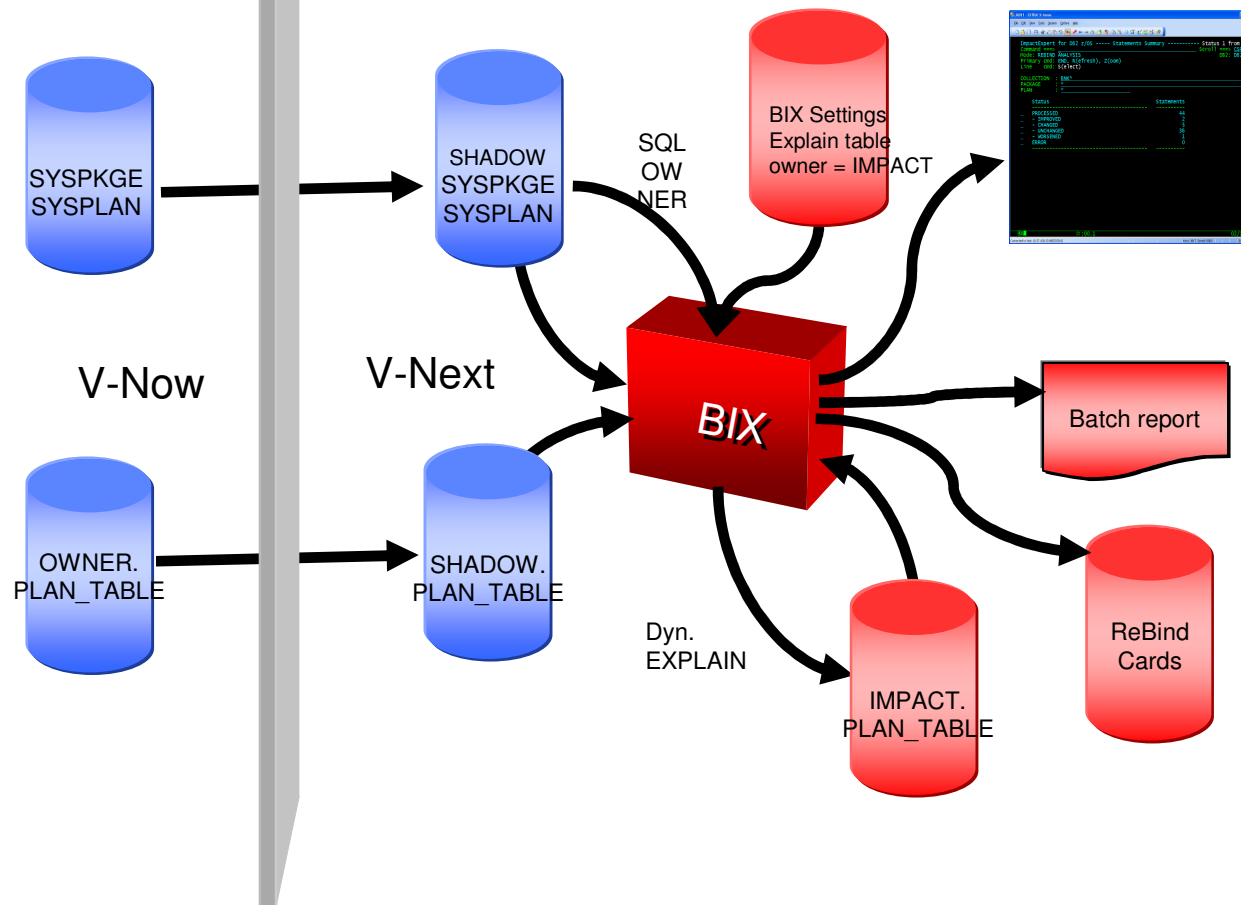
# REBIND analysis

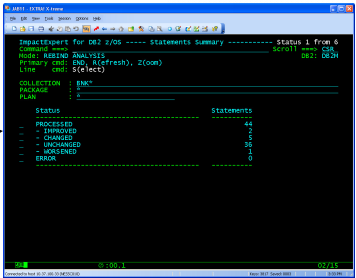






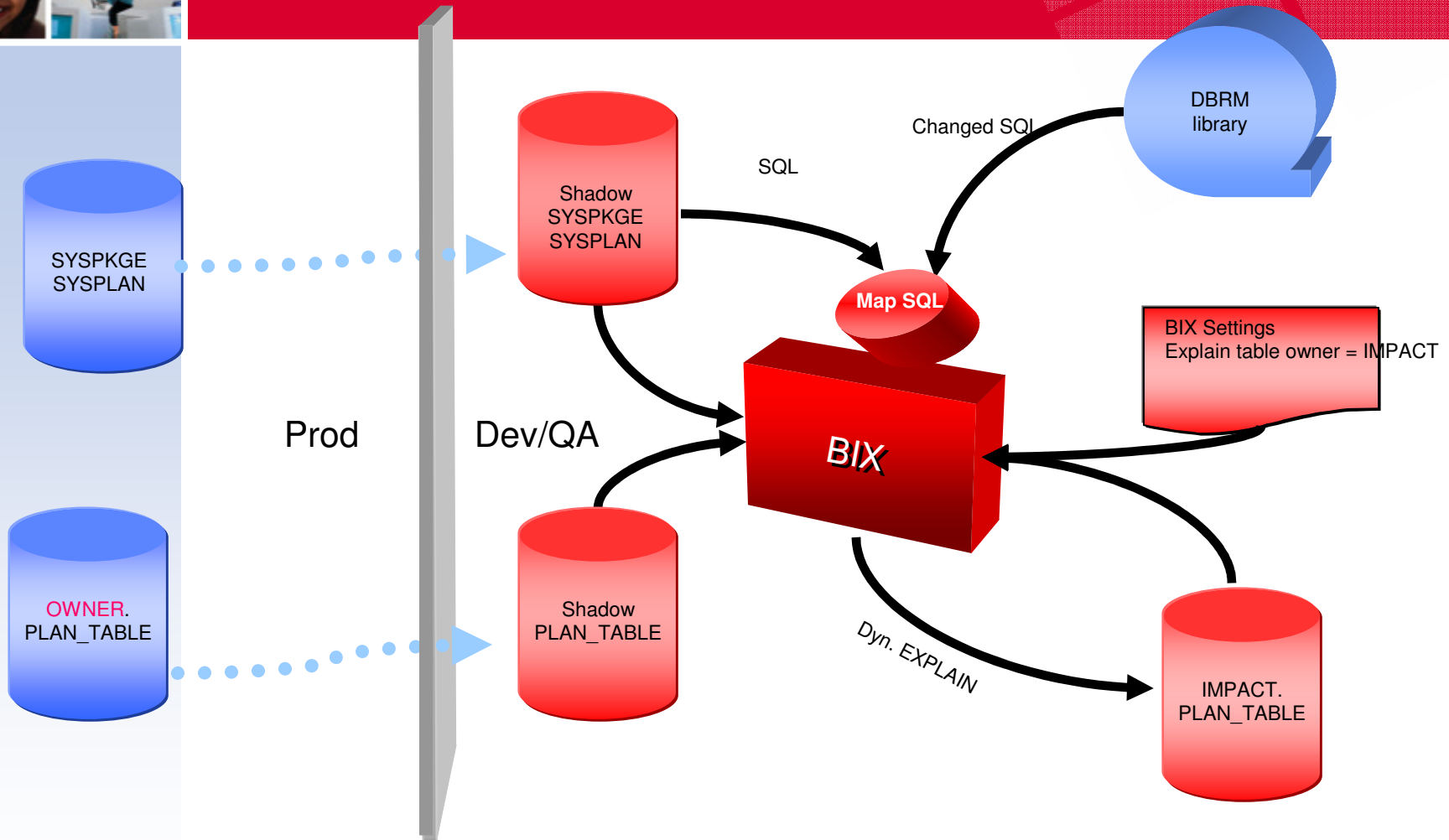
## EarlyPrecheck





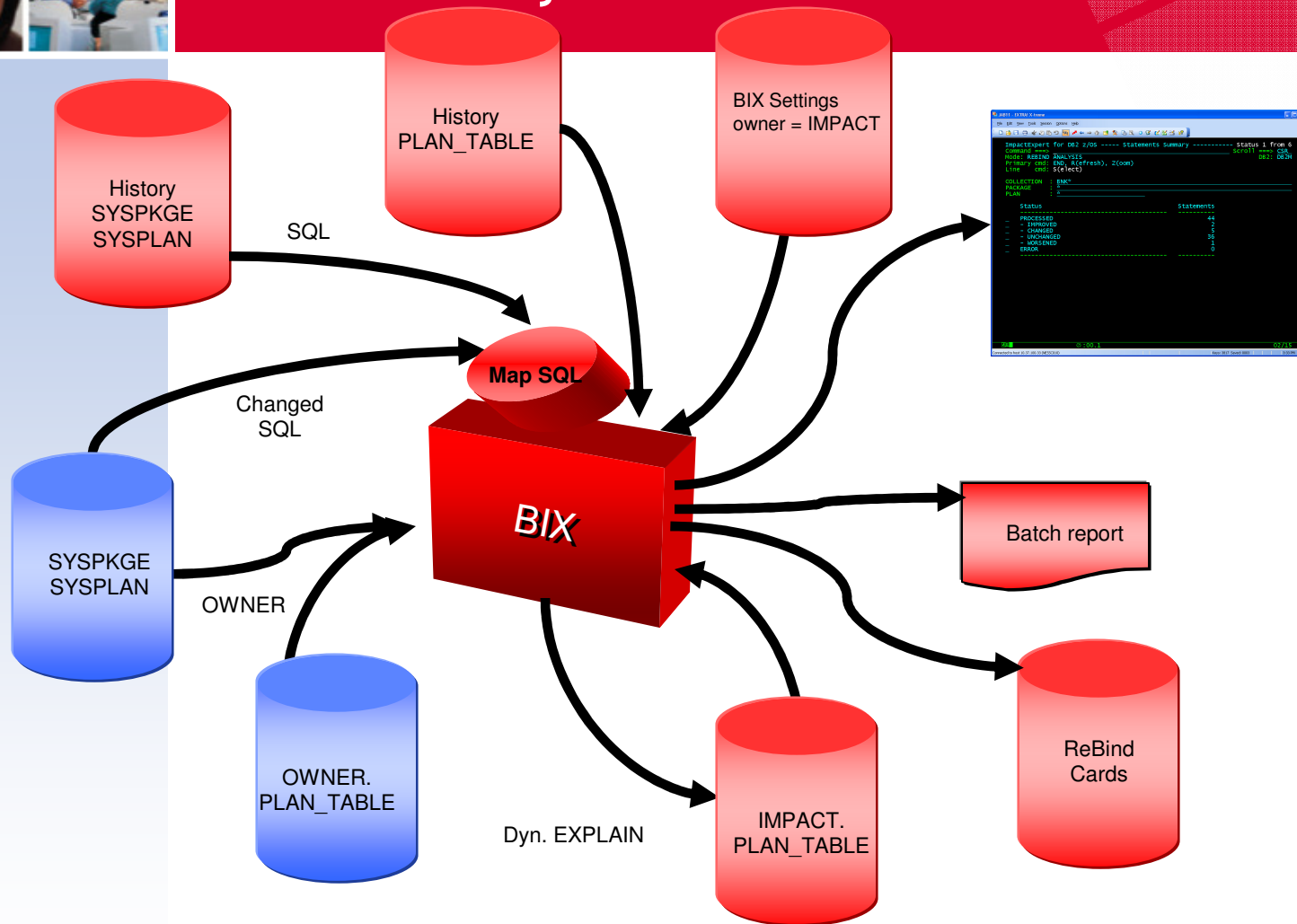


## Pre-BIND analysis (Production Baseline)





## Post-BIND analysis





# ISPF Main Menu

```
ImpactExpert for DB2 z/OS ----- Main Menu ----- Version 6.10
Command ==> _____ DB2: DB2M

Primary cmd: END, s(ettings), c(leanup), A(bout)
Line      cmd: s(elect)

  scenario                      Base          Recent          Dyn          Convert
  -----                      -          -          Exp1         Qual.  Owner    DRDA
  -----                      -          -          -          -      -      -
  _ REBIND Analysis             catalog      -          YES          -        N        -
  _ Pre-BIND Local              catalog      DBRM        YES          -        N        -
  _ Post-BIND Local             History     catalog     NO          -        -        -
  _ Pre-BIND Prod-Baseline      Export (*)  DBRM        YES          N        -        N
  _ Post-BIND Prod-Baseline      Export (*)  catalog     NO          N        -        N
  _ Early Precheck static       Export (*)  -          YES          N        -        N
  _ Early Precheck Dynamic      Export (*)  -          YES          N        -        -
  _ Dynamic SQL                 dynstmtcache -          YES          -        -        -

  _ Plan_table compare          Plan_table 1 Plan_table 2 NO
  _ DBRM reconstruct           catalog      NO

NOTE (*): Use export/import function to update BIX export tables.
```



# Bind ImpactExpert Rules

```
ImpactExpert for DB2 z/OS ----- Rules ----- Rule 1 from 9
Command ==> _____ scroll ==> CSR
DB2: DB2M
```

```
Primary cmd: END, CAN(cel), Z(oom)
Line      cmd: -
```

No	Abbr	Short text	Weight	Rating
1	TS	Tablespace scan	8	<u>BAD</u>
2	NMIX	Nonmatching IX SCAN	5	<u>AVG</u>
3	MIX	Multiple IX access	1	<u>AVG</u>
4	LP	List Prefetch	3	<u>AVG</u>
5	SORT	Sort	4	<u>AVG</u>
6	HBJN	Hybrid Join	1	<u>AVG</u>
7	NXO	INDEXONLY = NO	1	<u>GOOD</u>
8	MSJN	Merge scan Join	1	<u>AVG</u>
9	WF	View Materialization	1	<u>AVG</u>

```
· display · filter · view · print · options · help · · · · ·
```

```
4B
```

```
@ :00.3
```

```
02/15
```



# Bind ImpactExpert Settings

```
ImpactExpert for DB2 z/OS ----- ImpactExpert Settings ----- Setting 61 from 68
Command ==> _____ scroll ==> CSR
                                     DB2: DB2M

Primary cmd: END, CAN(ce1), F(ilter), T(ext on/off), L(ocate) setting
Line      cmd: s(elect), G(lobal change), R(eset to DEFAULT)

Profile: JAB1          Creator . .: JAB1
                   Description: Default profile for IQA

  Category
  Setting                                     value      valid input
-----
Thresholds
-  MS ABSOLUTE APC                          N          Y/N
-  MS REBIND DECISION                       N          Y/N
-  MS THRESHOLD GOOD                        25         0 to 100
-  MS THRESHOLD AVG                         50         0 to 100
-  SU ABSOLUTE APC                          N          Y/N
-  SU REBIND DECISION                       N          Y/N
-  SU THRESHOLD GOOD                        25         0 to 100
-  SU THRESHOLD AVG                         50         0 to 100
-----

' display ' filter ' view ' print ' options ' Help ' . . . . .
41B  :00.1 02/15
```





# ISPF Main Menu

```
ImpactExpert for DB2 z/OS ----- Main Menu ----- Version 6.10
Command ==> _____ DB2: DB2M

Primary cmd: END, s(ettings), c(leanup), A(bout)
Line      cmd: s(elect)

  scenario                      Base          Recent          Dyn          Convert
  -----                      -          -          Exp1        Qual.  Owner    DRDA
  _ REBIND Analysis             catalog    -              YES         -        N        -
  _ Pre-BIND Local              catalog    DBRM           YES         -        N        -
  _ Post-BIND Local             History    catalog        NO          -        -        -
  _ Pre-BIND Prod-Baseline      Export (*) DBRM           YES         N        -        N
  _ Post-BIND Prod-Baseline      Export (*) catalog    NO          N        -        N
  _ Early Precheck Static        Export (*) -              YES         N        -        N
  _ Early Precheck dynamic       Export (*) -              YES         N        -        -
  _ Dynamic SQL                 dynstmtcache -              YES         -        -        -

  _ Plan_table compare          Plan_table 1 Plan_table 2 NO
  _ DBRM reconstruct           catalog    NO

NOTE (*): Use export/import function to update BIX export tables.
```

4B

:00.1

02/15



# Rebind Selection

```
ImpactExpert for DB2 z/OS ----- REBIND Package Impact -----
Command ==> _____ DB2: DB2M

Primary cmd: END, P(REBIND Plan impact), Z(oom)

COLLECTION  : BNK*
PACKAGE     : *
VERSION     : 
VERS-TYPE   : L L(ast version) / N(o version) / *(All versions)

Additional filter options:
OBJECT TYPE : *  *(ALL)          F(user def. Function or cast function)
              T(able)           O(stored procedure)
              R(Table space)    A(lias)
              P(artition tablespace) S(ynonym)
              I(ndex)          V(iew)

OBJ. CREATOR: *
OBJECT NAME : *
```

4/8

© :07.6

06/16



## Batch analyze JCL

```
ImpactExpert for DB2 z/OS ----- change Data -----
EDIT      SYS09027.T102823.RA000.JAB1.R0301447      columns 00001 00072
Command ==>                                         scroll ==> CSR
***** ***** Top of Data *****
000001 //JAB1BPRE JOB (), 'JAB1', USER=JAB1,
000002 //      NOTIFY=JAB1, CLASS=P, MSGCLASS=X
- - - - - 2 Line(s) not Displayed
000005 /**-----
000006 /** ImpactExpert for DB2 z/OS   version 6.10   PTF_08330
000007 /**-----
- - - - - 3 Line(s) not Displayed
000011 //CHKRBIND EXEC PGM=BAIMM100,
- - - - - 6 Line(s) not Displayed
000018 //BAIMANCO DD *
000019 <?xml version="1.0" encoding="ibm-1141" standalone="yes"?>
- - - - - 87 Line(s) not Displayed
000107     <ANALYZE>
000108         <COLLID      VALUE="BNK*" />
000109         <PACKAGE     VALUE="*" />
000110         <VERSION-TYPE VALUE="L" />
000111     </ANALYZE>
000112
000113 </ANCO>
000114 //BAIMOUT DD SYSOUT=*, DCB=(LRECL=80, RECFM=FB)
- - - - - 3 Line(s) not Displayed
000118 /** To use REBIND syntax delete the line above and the ANALYZE command
000119 /** block in BAIMANCO file and replace collection, progname and version
000120 //BAIMIN DD *
000121     DSN SYSTEM(DB2M)
000122     REBIND PACKAGE +
000123     (collection.progname.+
000124     (version))
```

4B

:01.8

15/02



# Batch Analysis Summary

```

  Display Filter view print options Help
-----
SDSF OUTPUT DISPLAY JAB1BP00 JOB20169  DSID   104 LINE 402      COLUMNS 02- 81
COMMAND INPUT ==>          SCROLL ==> CSR
summary for RunID: 2009-01-26-18.13.00.050000

Commands (analyzed)
  REBINDs generated . . . . :           8
  REBINDs omitted   . . . . :           0

Commands (not analyzed, see reasons below)
  REBINDs generated . . . . :           0
  REBINDs omitted   . . . . :          10

ImpactExpert for DB2 z/os                                2009-01-26 18:13:01  Page    9

Commands summary
  REBINDs generated . . . . :           8
  REBINDs omitted   . . . . :          10

Plans
  analyzed . . . . . :           0      invalid 0      inoperative 0

Packages/DBRMS
  analyzed . . . . . :           8      invalid 0      inoperative 0
  improved  . . . . . :           0      invalid 0      inoperative 0
  worsened  . . . . . :           1      invalid 0      inoperative 0
  unchanged . . . . . :           3      invalid 0      inoperative 0
  changed   . . . . . :           4      invalid 0      inoperative 0
  new       . . . . . :           0      invalid 0      inoperative 0

SQL statements
[A]B  :00.1 04/21

```



# Do the math

```

Vista Session A
File Edit Font Transfer Macro Options Window Help
[Icons] [A] [B] [C] [?]

Menu Utilities Compilers Help

BROWSE      TMS1.OUTPUT                      Line 00000002 Col 001 080
Command ==>                               Scroll ==> CSR
ImpactExpert for DB2 z/OS                  10/09/2006 09:56:59 Page 1

Collection: IQA_COLLECTION_510
Package    : ADB2M220
Version    : 2003-08-22-10.28.28.743522

  Stmtno | Rule violation                | Quantity | Weighted | Difference
  +-----+-----+-----+-----+-----+
  | 3038 | Tablespace Scan (8)          | 2         | 16        | 0
  |      | Sort (4)                    | 1         | 4         | 0
  |      | INDEXONLY = NO (1)          | 2         | 2         | 0
  |      | sum                          | 5         | 22        | 0
  +-----+-----+-----+-----+
  | 6394 | Tablespace Scan (8)          | 0         | 0         | 8
  |      | INDEXONLY = NO (1)          | 1         | 1         | 0
  |      | sum                          | 1         | 9         | 8
  +-----+-----+-----+-----+
  | 6458 | Tablespace Scan (8)          | 1         | 8         | -8
  |      | Nonmatching IX SCAN (5)     | 0         | 0         | 5
  |      | INDEXONLY = NO (1)          | 1         | 1         | -1
  |      | sum                          | 2         | 9         | -4

SQL stmts analyzed (3), improved (1), worsened (1), unchanged (1)

*** No REBIND generated to avoid worse access paths ***

M0 0.1 10/09/06.282 11:05AM sysc.neonesoft.com a 4,15
  
```



# Something New

Vista Session A

File Edit Font Transfer Macro Options Window Help

Menu Utilities Compilers Help

BROWSE TMS1.OUTPUT2 Line 00000001 Col 002 081  
 Command ==> Scroll ==> CSR

Library : MKT.SEG.PRE6046.IQA0510.DM7C.DBRM  
 Collection: IQA\_COLLECTION\_510  
 Package : ADBZUCTS  
 Version : 2006-07-28-13.05.36.020867

Stmnto	old	new	Rule violation	Quantity	Weighted	Difference
				old	new	
508	508		Tablespace Scan (8)	0	1	8
			Nonmatching IX SCAN (5)	1	0	-5
			INDEXONLY = NO (1)	1	1	0
			sum	2	2	3
675	684		Nonmatching IX SCAN (5)	1	0	-5
			Sort (4)	1	1	0
			INDEXONLY = NO (1)	5	5	0
			sum	7	6	-5
782	n/a		Nonmatching IX SCAN (5)	1	0	-5
			Sort (4)	1	0	-4
			sum	2	0	-9
n/a	825		Nonmatching IX SCAN (5)	0	1	5
			sum	0	1	5

SQL stmts analyzed (4), improved (1), worsened (1), new (1), old (1)

MA 0.1 10/09/06.282 11:39AM sysc.neonesoft.com a 5,15



# ISPF Analysis Overview

```
ImpactExpert for DB2 z/OS ----- statements summary ----- status 1 from 6
Command ==> _____ scroll ==> CSR
Mode: REBIND ANALYSIS DB2: DB2M
Primary cmd: END, R(efresh), Z(oom)
Line cmd: s(elect)
```

```
COLLECTION : *
PACKAGE : *
PLAN : *
```

Status	Statements
PROCESSED	44
- IMPROVED	2
- CHANGED	5
- UNCHANGED	36
- WORSENER	1
ERROR	0





## Drill Down

```
ImpactExpert for DB2 z/OS -- REBIND Overview (1/5) ----- Statement 1 from 1
Command ==> _____ scroll ==> CSR
Mode: REBIND ANALYSIS DB2: DB2M
Primary cmd: END, SE(tup Analyze), Z(oom), L(ocate) submit time
Line cmd: s(elect), A(nalyze), D(ynamic analyze), E(dit and analyze),
          v(iew), Z(oom)
```

	Program	stmtNo	Imp	Bad access types before REBIND	Bad access types with REBIND	Hint
—	BNKMPU2	359	WRS	NMIX	TS, SORT	

4B

:00.3

02/15



# Drill Down

```
ImpactExpert for DB2 z/OS ----- Explain Data (1/5) ----- Entry 1 from 1
Command ==> _____ scroll ==> CSR_
EXPLAIN: STATIC          MODE: CATALOG                      DB2: DB2M
Primary cmd: END, T(Explain Text), V(iolations), R(unstats), P(redicates),
              S(tatement Text), C(atalog Data), M(ode catalog/History), Z(oom),
              PR(int Reports), SAVExxx, SHOWxxx
Line   cmd: Z(oom), I(ndexes of table), S(hort catalog), T(able), X(Index)

Collection : BNKCOL2          Package : BNKMPU2          Stmt :      359
Version    :
Milliseconds:      1  Service Units:      3  Cost Category: A

  QBNO QBTYPE CREATOR  TABLE NAME      MTCH IX METH PRNT TABL PRE  MXO
  PLNO TABNO  XCREATOR INDEX NAME        ACTYP COLS ON OD  QBLK TYPE FTCH PSQ
  ---- -
-    1 SELECT  BANKJX   LOANS              I      0 N  0   0 T      0
  1 1         BANKJX   XLOANS2
  ---- -
```

4B

:00.1

02/15



# Catalog Data

```
ImpactExpert for DB2 z/OS ----- catalog Data ----- LINE 00000001 COL 001 080
Command ==> _____ scroll ==> CSR_
Mode: REBIND ANALYSIS DB2: DB2M
Primary cmd: END, P(Access Paths), s(statement)

collection . BNKCOL2          Timestamp. . 2009-01-16-15.10.44.590000
Package. . . BNKMPU2          Contoken . . 1850354B06BD2BBD
StmntNo . . . 359             Bindtime . . 2008-06-06-23.29.19.646120

-----
Table: BANKJX.LOANS
Stats: 2008-06-07-00.15.22.013846
      No. of rows (CARDF): 43.089 / 829 pages

Index: BANKJX.XLOANS1
Stats: 2008-06-07-00.15.22.013846
      Levels: 3 / 428 leaf pages
      Primary Key, CLUSTERRATIO = 75,33%
      Indexcolumn | Format | Dist. values | A/D | NL | stats
      -----+-----+-----+-----+-----+-----
      LOAN_LOANNO | CHAR(10) | 43.081 | ASC | N | OK
      LOAN_CUSTNO | CHAR(10) | 21.475 | ASC | N | OK

Index: BANKJX.XLOANS2
Stats: 2008-06-07-00.15.22.013846
      Levels: 2 / 160 leaf pages
      CLUSTERRATIO = 89,00%
      Indexcolumn | Format | Dist. values | A/D | NL | stats
      -----+-----+-----+-----+-----+-----
      LOAN_CUSTNO | CHAR(10) | 21.475 | ASC | N | OK

***** Bottom of Data *****
4B :00.1 02/15
```



# RUNSTATS Analysis

```
ImpactExpert for DB2 z/OS ----- Runstats ----- LINE 00000001 COL 001 080
Command ==> _____ scroll ==> CSR
EXPLAIN: STATIC          MODE: CATALOG          DB2: DB2M
Primary cmd: END, D(Explain Data), T(Explain Text), V(iolations), P(predicates),
              S(tatement Text), C(atalog Data), M(ode catalog/History),
              PR(int Rep.), SAVEXXX, SHOWXXX

COLLECTION : BNKCOL2          PACKAGE : BNKMPU2          STMT :          359
VERSION      :

-----
OUTPUT FOR SQL STATEMENT

USED PARAMETERS:
  MESSAGE LEVEL: I
  TOLERANCES: 10% AND 01000 CARDF.
  TIMESTAMPS OBSOLETE AFTER 180 DAYS.

VIOLATION  <DBNAME>.<TSNAME> <TBCREA>.<TBNAME> <PARTS>

VIOLATION  BANKJXDB.BANKJXLO BANKJX.LOANS
W - OBSOLETE SYSTABLES . . . . . : 2008-06-07-00.15.22.013846
W - MISSING INDEX FREQVAL NUMCOLS : BANKJX.XLOANS1 NUMCOLS 00002

summary output for SQL statement

Tables read . . . . . : 1
Tables ignored . . . . . : 0
Tables checked . . . . . : 1
Perfect tables . . . . . : 0
Indexes checked . . . . . : 2
Columns checked . . . . . : 10
```

4B

:00.1

02/15



## SQL PerformanceExpert Interface

```
ImpactExpert for DB2 z/OS ----- violations ----- LINE 00000001 COL 001 080
Command ==> _____ scroll ==> CSR
EXPLAIN: STATIC          MODE: CATALOG          DB2: DB2M
Primary cmd: END, D(Explain Data), T(Explain Text), R(unstats), P(predicates),
              S(statement Text), C(atalog data), M(ode catalog/History),
              PR(int Reports), SAVExxx, SHOWxxx

COLLECTION : BNKCOL2          PACKAGE : BNKMPU2          STMT :          359
VERSION      :

-----
----- RULE-NO.: 9006 (WARNING) -----
Non matching index scan on an index with a bad clusterratio: I/O overhead is
high. QBLOCKNO: 1, PLANNO: 1
Try to change the WHERE clause. If the index was defined as clustered, run
REORG TABLESPACE and RUNSTATS.
----- RULE-NO.: 9022 (WARNING) -----
Package was bound with ISOLATIONLEVEL(CS) and CURRENTDATA(YES).
check if the package can be bound with CURRENTDATA(NO) to avoid unnessecary
locks.
----- RULE-NO.: 9055 (WARNING) -----
Non matching index scan, NLEAF > 32 and INDEXONLY = N. QBLOCKNO: 1, PLANNO: 1
Try to create the index access with as many matching columns as possible.
----- RULE-NO.: 9066 (WARNING) -----
RUNSTATS statistics in DB2 catalog for table BANKJX.LOANS are newer than those
of explain time. catalog table(s) affected: SYSTABLES
Always do a REBIND ... EXPLAIN(YES) after every RUNSTATS.
----- RULE-NO.: 9066 (WARNING) -----
RUNSTATS statistics in DB2 catalog for table BANKJX.LOANS are newer than those
of explain time. catalog table(s) affected: SYSTABLESPACE
Always do a REBIND ... EXPLAIN(YES) after every RUNSTATS.
----- RULE-NO.: 9066 (WARNING) -----
```

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02/15



# Production Simulator



# Production Simulator

```
ImpactExpert for DB2 z/OS ----- Job overview (1/5) -----
C
M
P
L
----- Export -----
Command ==>
Primary cmd: END
_ Extract V-now catalog statistics using ProductionSimulator
_ Unload V-now PLAN/PACKAGE and PLAN_TABLE data

====> CSR
DB2: DB2M
m),

Job status
-----

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```





# Production Simulator

```
ImpactExpert for DB2 z/OS ----- Change Data -----
EDIT      SYS09026.T180642.RA000.JAB1.R0300861      columns 00001 00072
Command ==>                                     scroll ==> CSR
***** ***** Top of Data *****
000001 //JAB1BIX1 JOB (), 'JAB1',USER=JAB1,
000002 //      NOTIFY=JAB1,CLASS=P,MSGCLASS=X
- - - - - 43 Line(s) not Displayed
000046 /*-----
000047 //CRECLU EXEC PGM=IDCAMS
000048 //SYSPRINT DD SYSOUT=*
000049 //SYSIN DD *
000050 DEL ('JAB6.PRODUCT.IQA0610.DB2M.VSAM.KSDS')
000051 IF LASTCC = 8 THEN SET MAXCC = 0
000052
000053 DEFINE CLUSTER(NAME('JAB6.PRODUCT.IQA0610.DB2M.VSAM.KSDS') -
000054 INDEXED
- - - - - 37 Line(s) not Displayed
000092 //PDB2IN DD *
000093 DB2-SYSTEM
000094 SOURCEDB2 = DB2M
000095 TARGETDB2 = DB2M
000096 INCLUDE-OBJECT
000097 DBNAME = database
000098 (TSNAME = tablespace
000099 (TBCREA = tablecreator TBNAME = tablename )
000100 (IXCREA = indexcreator IXNAME = indexname )
000101 (SCHEMA = schema SPECIFICNAME = routinename)
000102 (CONVERT-OBJECT
000103 (S-DBNAME = source-database T-DBNAME = target-database )
000104 (S-TSNAME = source-tablespace T-TSNAME = target-tablespace )
000105 (S-TBCREATOR = source-tablecreator T-TBCREATOR = target-tablecreator )
000106 (S-TBNAME = source-tablename T-TBNAME = target-tablename )
```

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03/15



# Production Simulator

```
ImpactExpert for DB2 z/OS ----- change Data -----
EDIT      SYS09026.T180642.RA000.JAB1.R0300861      columns 00001 00072
Command ==>                                     scroll ==> CSR
-----
101 Line(s) not displayed
000105 //SYSIN      DD *
000106 UNLOAD DATA FROM TABLE IQA0610.IQATB021
000107 UNLDDN SYSREC00
000108 UNLOAD DATA FROM TABLE IQA0610.IQATB022
000109 UNLDDN SYSREC01
000110 UNLOAD DATA FROM TABLE IQA0610.IQATB023
000111 UNLDDN SYSREC02
000112 UNLOAD DATA FROM TABLE IQA0610.IQATB024
000113 UNLDDN SYSREC03
000114 UNLOAD DATA FROM TABLE IQA0610.IQATB025
000115 UNLDDN SYSREC04
000116 UNLOAD DATA FROM TABLE IQA0610.IQATB026
000117 UNLDDN SYSREC05
000118 UNLOAD DATA FROM TABLE IQA0610.IQATB027
000119 UNLDDN SYSREC06
000120 UNLOAD DATA FROM TABLE IQA0610.IQATB028
000121 UNLDDN SYSREC07
000122 //
***** ***** Bottom of Data *****
```

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# Production Simulator

```
ImpactExpert for DB2 z/OS ----- Job overview (1/5) ----- Job 1 from 1
C                                     ==> CSR
M                                     B2: DB2M
P                                     ,
L                                     '

----- Import -----
Command ==>
Primary cmd: END

_ Apply v-now statistics into v-next using ProductionSimulator
_ Load v-now data into v-next environment

ob status
-----
ONE
-----

display filter view print options help . . . . .
4B  :00.2 04/19
```



## In Summary

Function	Old SQL	New SQL	dynamic Explain	Convert Qualifier	Convert Owner	Convert Collid
REBIND Analysis	Catalog	-	✓	✗	✓	✗
Early Precheck	Shadow	-	✓	✓	✗	✗
Pre-BIND Analysis	Catalog	DBRM	✓	✗	✓	✗
Post-BIND Analysis	History	Catalog	○	✗	✗	✗
Pre-BIND Analysis Production Baseline	Shadow	DBRM	✓	✓	✗	✗
Post-BIND Analysis Production Baseline	Shadow	Catalog	○	✓	✗	✓